

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/404,932	FRIEDL ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Kandasamy Thangavelu	2123	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to May 12, 2004.
2. ☒ The allowed claim(s) is/are 47-49, 51-54, 56-59, 61-66 and 68-74.
3. ☒ The drawings filed on 29 December 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |  |
|---|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)  | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                    |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance   |
|   | 9. <input type="checkbox"/> Other _____.   |

*[Signature]*  
**KEVIN J. TESKA**  
**SUPERVISORY**  
**PATENT EXAMINER**  
 Part of Paper No./Mail Date 14

## **DETAILED ACTION**

### ***Introduction***

1. This communication is in response to the Applicants' communications dated May 12, 2004. Claims 1-46, 50, 55, 60 and 67 were deleted. Claims 47, 51, 52, 56, 62 and 65 were amended. Claims 68-74 were added. Claims 47-49, 51-54, 56-59, 61-66 and 68-74 of the application are pending.

### ***Examiner's Amendment***

2. Authorization for this examiner's amendment was given in a telephone interview with Mr. William Haulbrook on July 1, 2004.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

3. The application has been amended as follows:

In Claim 74, change:

Art Unit: 2123

“(c) determine a location of a solid/liquid interface by determining locations at which a process variable achieves a given value; and

(d) remove from the solution domain nodes corresponding to elements which contain no unfrozen material.”

to

--(c) solve for process variables using conservation of mass, conservation of momentum, and conservation of energy equations for at least a portion of the solution domain;

(d) determine a location of a solid/liquid interface by determining locations at which a process variable achieves a given value; and

(e) remove from the solution domain nodes corresponding to elements which contain no unfrozen material.--.

### ***Reasons for Allowance***

4. Claims 47-49, 51-54, 56-59, 61-66 and 68-74 of the application are allowed over prior art of record.

5. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

Art Unit: 2123

(1) a method of simulating fluid flow within a three-dimensional object manufactured by injection molding; finite element and finite differences methods are used to solve the governing equations of fluid flow and heat transfer; the quantities calculated include the position of the melt front, the pressure distribution throughout the plastic and the temperature of the plastic material at any point at any time during filling and packing phases; these data are used to generate data on distributions of shear rate, shear stress, velocity, viscosity, flow direction and orientation of material; the information generated is used to make changes to the component geometry, position of injection locations, processing conditions etc.; (**Yu et al.**, U. S. Patent 6,096,088);

(2) applying finite element methods for simulation of the filling and packing phases of injection molding; developing the mass, momentum and energy equations for the filling and packing phases; specifying the boundary conditions for the two phases; generating the triangular mesh of the domain to cover the surface of the molten material; solving for the variables using finite element and finite difference methods and displaying the results; analyzing the advancement of the flow front; (**Peter Kennedy**, "Flow analysis of injection molds", Hanser Publishers, New York, 1995); and

(3) a three-dimensional simulation tool for injection molding process; use of Galerkin finite element method to develop discrete equations for the linear tetrahedral defining the domain; use of anisotropic mesh in which the mesh is selectively refined in the thickness direction to capture the thermal boundary layer; filling profile and pressure and temperature distributions are predicted for the filling phase; during the packing phase, the velocity distribution is determined from the pressure field at the end of filling phase; (**Talwar et al.**,

Art Unit: 2123

“Three-dimensional simulation of polymer injection molding: verification”, Provided by the Applicants as part of IDS).

5.1 Applicant's first set of claims consists of Claims 47-49, 51-54 and 68-70.

Independent Claim 47 is directed to a method for modeling injection of a fluid into a mold defining a three dimensional cavity. The claim identifies the uniquely distinct features of:

“step (d) comprises the substep of using an explicit scheme in solving the conservation of energy equation, and wherein the explicit scheme comprises a thermal clock that varies locally and may proceed differently than a global clock”.

The closest prior art fails to teach or fairly the substep of using an explicit scheme in solving the conservation of energy equation, wherein the explicit scheme comprises a thermal clock that varies locally and may proceed differently than a global clock. Therefore, Claims 47-49, 51-54 and 68-70 are deemed novel and allowable.

5.2 Applicant's second set of claims consists of Claims 56-59, 61-64 and 71-73.

Independent Claim 56 is directed to a method for modeling injection of a fluid into a mold defining a three dimensional cavity. The claim identifies the uniquely distinct features of:

“step (d) further comprises the substep of removing from the solution domain nodes corresponding to elements which contain no unfrozen material”.

The closest prior art fails to teach or fairly suggest the substep of removing from the solution domain nodes corresponding to elements which contain no unfrozen material.

Therefore, Claims 56-59, 61-64 and 71-73 are deemed novel and allowable.

5.3 Applicant's third set of claims consists of Claims 65-66.

Independent Claim 25 is directed to an apparatus for modeling injection of a fluid into a mold defining a three dimensional cavity. The claim identifies the uniquely distinct features of:

“solve for process variables using conservation of mass, conservation of momentum and conservation of energy equations, wherein an explicit scheme is used to solve the conservation of energy equation; and wherein the explicit scheme comprises a thermal clock that varies locally and may proceed differently than a global clock”.

The closest prior art fails to teach or fairly suggest an explicit scheme used to solve the conservation of energy equation wherein the explicit scheme comprises a thermal clock that varies locally and may proceed differently than a global clock. Therefore, Claims 65-66 are deemed novel and allowable.

5.4 Applicant's third set of claims consists of Claim 74.

Independent Claim 74 is directed to an apparatus for modeling injection of a fluid into a mold defining a three dimensional cavity. The claim identifies the uniquely distinct features of:

“remove from the solution domain nodes corresponding to elements which contain no unfrozen material”.

Art Unit: 2123

The closest prior art fails to teach or fairly suggest removing from the solution domain nodes corresponding to elements which contain no unfrozen material. Therefore, Claim 74 is deemed novel and allowable.

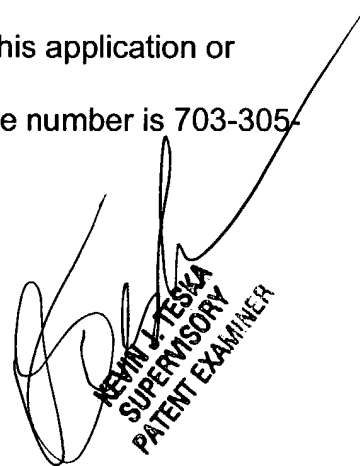
6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu  
Art Unit 2123  
July 1, 2004



KEVIN J. TESKA  
SUPERVISORY  
PATENT EXAMINER